3. LIMITING CONDITIONS FOR OPERATION

3.1 REACTOR COOLANT SYSTEM

Applicability

Applies to the operating status of the reactor coolant system.

Objective

To specify those limiting conditions for operation of the reactor coolant system which must be met to ensure safe reactor operations.

3.1.1 OPERATIONAL COMPONENTS

Specification

3.1.1.1 Reactor Coolant Pumps

A. Pump combinations permissible for given power levels shall be shown in specification table 2.3-1.

B. The boron concentration in the reactor coolant system shall not be reduced unless at least one reactor coolant pump or one decay heat removal pump is circulating reactor coolant.

C. Operation with two pumps shall be limited to 24 hours in any 30 day period.

3.1.1.2 Steam Generator

A. One steam generator shall be operable whenever the reactor coolant average temperature is above 280° F.

3.1.1.3 Pressurizer Safety Valves

A. The reactor shall not remain critical unless both pressurizer code safety valves are operable.

B. When the reactor is subcritical, at least one pressurizer code safety valve shall be operable if all reactor coolant system openings are closed, except for hydrostatic tests in accordance with ASME Boiler and Pressure Vessel Code, Section III.

3.1.1.4 Decay Heat Removal

A. At least two of the coolant loops listed below shall be operable when the coolant average temperature is below 280° F. except during fuel loading and refueling. 74

Limiting Conditions for Operation

1. Reactor Coolant Loop (A) and its associated steam generator and at least one associated reactor coolant pump,

2. Reactor Coolant Loop (B) and its associated steam generator and at least one associated reactor coolant pump,

3. Decay Heat Removal Loop (A)

4. Decay Heat Removal Loop (B)

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With less than the above required coolant loops OPERABLE, immediately initiate corrective action to return the required coolant loops to OPERABLE status as soon as possible; be in COLD SHUTDOWN within 20 hours.

Bases

A reactor coolant pump or decay heat removal pump is required to be in operation before the boron concentration is reduced by dilution with makeup water. Either pump will provide mixing which will prevent sudden positive reactivity changes caused by dilute coolant reaching the reactor. One decay heat removal pump will circulate the equivalent of the reactor coolant system volume in one half hour or less. (1)

The decay heat removal system suction piping is designed for 300°F and 300 psig; thus, the system can remove decay heat when the reactor coolant system is below this temperature. (2) (3)

One pressurizer code safety valve is capable of preventing overpressurization when the reactor is not critical since its relieving capacity is greater than that required by the sum of the available heat source which are pump energy, pressurizer heaters, and reactor decay heat. (4) Both pressurizer code safety valves are required to be in service prior to criticality to conform to the system design relief capabilities. The code safety valves prevent overpressure for rod withdrawal accidents. (5) The pressurizer code safety valve lift set point shall be set at 2500 psig ± 1 percent allowance for error and each valve shall be capable of relieving 345,000 lb/h of saturated steam at a pressure not greater than 3 percent above the set pressure.

Two-pump operation is limited until further ECCS analysis is performed.

When TAV is below 280° F. a single reactor coolant loop or DHR loop provides sufficient heat removal capability for removing decay heat; but single failure considerations require that at least two loops be OPERABLE. Thus, if the reactor coolant loops are not OPERABLE, this specification requires two DHR loops to be OPERABLE. 74

REFERENCES

(1) FSAR tables 9.5-2, 4.2-1, 4.2-2, 4.2-4, 4.2-5, 4.2-6

(2) FSAR paragraph 9.5.2.2 and 10.2.2

(3) FSAR paragraph 4.2.5

(4) FSAR paragraph 4.3.8.4 and 4.2.4

(5) FSAR paragraph 4.3.6 and 14.1.2.2.3

3.8 FUEL LOADING AND REFUELING

Applicability

Applies to fuel loading and refueling operations.

Objective

To ensure that fuel loading and refueling operations are performed in a responsible manner.

Specification

3.8.1 Radiation levels in the reactor building refueling area shall be monitored by R15026 and R15027. Radiation levels in the spent fuel storage area shall be monitored by R15028. If any of these instruments becomes inoperable, portable survey instrumentation, having the appropriate ranges and sensitivity to fully protect individuals involved in refueling operations, shall be used until the permanent instrumentation is returned to service.

3.8.2 Core subcritical neutron flux shall be continuously monitored by at least two neutron flux monitors, each with continuous indication available, whenever core geometry is being changed. When core geometry is not being changed, at least one neutron flux monitor shall be in service.

3.8.3 Two decay heat removal pumps and coolers shall be operable. One decay heat removal pump and cooler shall be operable when the transfer canal water level is above 37 feet. 74

3.8.4 During reactor vessel head removal and while loading and unloading fuel from the reactor, the boron concentration hall be maintained at not less than 1850 ppm.

3.8.5 Direct communications between the control room and the refueling personnel in the reactor building shall exist whenever changes in core geometry are taking place.

3.8.6 During the handling of irradiated fuel in the reactor building at least one door on the personnel and emergency hatches shall be closed. The equipment hatch cover shall be in place with a minimum of four bolts securing the cover to the sealing surfaces.

3.8.7 Isolation valves in lines containing automatic containment isolation valves shall be operable, or at least one shall be in a safety features position.

3.8.8 When two irradiated fuel assemblies are being handled simultaneously within the fuel transfer canal, a minimum of 10 feet separation shall be maintained between the assemblies at all times. Irradiated fuel assemblies may be handled with the auxiliary bridge crane provided no other irradiated fuel assembly is being handled in the fuel transfer canal.

3.8.9 If any of the above specified limiting conditions for fuel loading and refueling are not met, movement of fuel into the reactor core shall cease; action shall be initiated to correct the conditions so that the specified limits are met, and no operations which may increase the reactivity of the core shall be made.

3.8.10 The reactor building purge system, including the radiation monitors, R15001A and R15001B, shall be tested and verified to be operable immediately prior to refueling operations.

3.8.11 Irradiated fuel shall not be removed from the reactor until the unit has been subcritical for at least 72 hours.

3.8.12 No loads will be handled over irradiated fuel stored in the spent fuel pool, except the fuel assemblies themselves. A dead weight load test at the rated load will be performed on the fuel storage building handling bridge prior to each refueling.

Bases

Detailed written procedures will be available for use by refueling personnel. These procedures, the above specifications, and the design of the fuel handling equipment, as described in subsection 9.7 of the FSAR incorporating built-in interlocks and safety features, provide assurance that no incident could occur during the refueling operations that would result in a hazard to public health and safety. If no change is being made in core geometry, one flux monitor is sufficient. This permits maintenance on the instrumentation. Continuous monitoring of radiation levels and neutron flux provides immediate indication of an unsafe condition. The decay heat removal pump is used to maintain a uniform boron concentration. The refueling boron concentration indicated in Specification 3.8.4 will be maintained to ensure that the more restrictive of the following reactivity conditions is met:

1. Either a k_{eff} of 0.95 or less with all control rods removed from the core.

2. A boron concentration of $\geq$1800 ppm.

Specification 3.8.5 allows the control room operator to inform the reactor building personnel of any impending unsafe condition detected from the main control board indicators during fuel movement.

The Specification requiring testing reactor building purge termination is to verify that these components will function as required should a fuel handling accident occur that results in the release of significant fission products.

Specification 3.8.11 is required as the safety analysis for the fuel handling accident was based on the assumption that the reactor had been shut down for 72 hours and all 208 fuel pins in the hottest fuel assembly fail, releasing all gap activity.[2]

The requirement that at least one DHR loop be in operation ensures that (1) sufficient cooling capacity is available to remove decay heat and maintain the water in the reactor pressure vessel below 140°F as required during the REFUELING, and (2) sufficient coolant circulation is maintained through the reactor core to minimize the effect of a boron dilution incident and prevent boron stratification. 74

The requirement to have two DHR loops OPERABLE when there is less than 37 feet of water above the core ensures that a single failure of the operating DHR loop will not result in a complete loss of decay heat removal capability. With the reactor vessel head removed and 37 feet of water above the core, a large heat sink is available for core cooling. Thus, in the event of a failure of the operating DHR loop, adequate time is provided to initiate emergency procedures to cool the core.

REFERENCES

(1) FSAR, subsection 9.5

(2) FSAR, paragraph 14.2.2.3.2